Translator`s Certificate

I, Ingrid Waldherr-Aigner, a translator of Wesendonkstrasse 43, 81925 Munich, Germany, being fully conversant with the English and German languages, hereby certify that to the best of my knowledge and belief the following is a true translation into the English language, which has been made by me and for which I accept responsibility, of the Specification of the International Patent Application No: PCT/EP98/02667.

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Pincers for Moving Flexible Strand Material

This invention relates to pincers for moving flexible strand material, particularly flexible rods for pulling cables into cable protection sleeves, said pincers comprising a pincer body having a longitudinal opening for receiving a part of the strand material, and a handle mounted for pivoting, said handle being supported in the pincer body in such a way that it engages at least partially in said longitudinal opening of the pincer body when operated.

Pincers of this kind are known from prior art. Document DE 34 16 652 C2 for example discloses pincers of the type concerned, which pincers have a longitudinal slot for receiving a part of the strand material, e.g. cables, with a clamping strip being provided which is displaceable relative to the slot and which can be operated by a handle. Further pincers are known form document DE 37 10 922 C1, which pincers have an elongated handle part and an enlarged head part moulded to it, with a strip being moulded to the handle and supported in said head part in such a way that it engages at least partially in said elongate groove of the pincer body when the handle is operated. The above-described pincers proved worthwhile for the handling of flexible strand material.

Starting from this prior art, it is a p r o b l e m of the invention to further develop pincers of the type concerned in such a way that the handling of the pincers is made much easier, while it is particularly aimed at reducing the forces to be applied in order to move the flexible strand material and enabling the flexible strand material to be displaced without moving the pincers per se.

The s o l u t i o n of this problem provides for a driveable transport device being arranged opposite the handle in the pincer body.

Accordingly, the pincers according to the invention provide for a transport device, for example a driving wheel, which acts upon the flexible strand material through frictional engagement and moves said flexible strand material in the longitudinal direction of the pincer body. To attain the required frictional force, a handle is pressed against the strand material, so that the strand material can be transported on the transport device with a high frictional force. The handle has a pressing surface which is in the form of a circular arc section. In combination with a device for storing and paying out the strand material it is provided that the radius of the pressing surface of the handle in the form of a circular arc section substantially corresponds with the radius of a dispenser drum which serves for storing the strand material. Accordingly, the handle with the pressing surface serves as a pressing lever and additionally has the function of tensioning the belt by means of the pressure force applied. The pressing surface is configured as a sliding strip, so that in this area, i.e. in the area between the strand material and the sliding strip, the frictional force is as low as possible.

Preferably, the transport device is configured as a driving belt which is arranged to revolve in the longitudinal direction of the pincer body. An advantage of the driving belt is that the strand material is in contact with the transport device over a large length of the pincer body. In its surface facing the strand material the driving belt preferably has a recess. Preferably, the cross-section of this recess is semicircular and particularly corresponds with the half cross-section of the strand material. However, it is also conceivable to select a cross-sectional form of the recess which is dif-

ferent from the aforementioned cross-sectional form. While e.g. a triangular cross-section proved worthwhile for the recess, it is also possible to configure said recess with a polygonal cross-section. The triangular configuration of the recess offers the advantage in particular that this recess is substantially independent from the diameter of the strand material, which means that the two side faces of the recess act upon the strand material.

Furthermore, it is provided that the transport device includes a shaft for connecting a driving means, which shaft protrudes beyond one side face at least of the pincer body. To this shaft the driving means of the transport device can be connected, and in the case of a driving belt revolving about two mutually spaced deflection rollers it turned out to be advantageous to have both shafts of the deflection rollers protrude beyond at least one side face of the pincer body, so that the required driving torque can be transmitted to the driving belt through both shafts of the deflection rollers. This will guarantee that in both transport directions of the transport means a tractive force can be summoned up in the upper run, i.e. in the run of the driving belt facing the strand material.

The shaft is configured with a polygonal cross-section at least on its end protruding beyond one side face of the pincer body. A polygonally configured cross-section of the shaft has the advantage that the transmission of the driving torque between the driving means and the transport means can take place positively or non-positively at a corresponding configuration of the connection elements. Preferably, the driving of the transport device is effected manually by means of a crank and/or mechanically by means of e.g. an electric motor and/or by means of a hand drill or the like. The end of the shaft configured with a polygonal cross-section is par-

ticularly hexagonal in the form of a bit holder. Preferably, said bit holder has a ball head in the usual configuration, so that the driving means can be slantingly coupled to the shaft also under a certain angle.

The driving belt is particularly configured as a toothed belt in order to enable a positive and/or non-positive transmission of moments between the deflection rollers and the driving belt. Here it turned out to be an advantage, as already mentioned above, that the driving belt revolves about two mutually spaced driving rollers. Both driving rollers are adapted to be driven. At least one of said driving rollers is configured as a driving pinion, so that a positive transmission of moments takes place at least between the driving pinion and the toothed belt.

The driving belt or transport device has a surface which increases the coefficient of friction. This surface can be formed either by material-specific components of the driving belt or by a coating of a usual driving belt.

According to a further feature of the invention it is provided that the pincer body has at least one and preferably more guide rollers which are arranged ahead of and/or behind the transport device in the longitudinal direction of the pincer body. Instead of guide rollers other guide members may be arranged, for example guide plates or the like. The guide members or guide rollers offer the advantage that the strand material is fed in a preferred position of the transport device, so that a maximum possible transmission of friction force takes place.

Preferably, the guide rollers have a reduced cross-section in their middle portion, for it turned out to be an advantage to set the distance between the reduced cross-section and the transport device corresponding to the

diameter of the strand material to be transported, so that the strand material is compulsorily passed through the reduced cross-section. It turned out to be an advantage to configure the shaft as one part with the driving roller or the toothed driving disk and/or the bit holder. Production will be greatly simplified thereby, resulting in less cost for manufacturing the pincers according to the invention.

The pincer body particularly consists of an elongate handle part and a head member moulded to it, so that the user can operate the pincers with one hand.

According to a further feature it is provided that the pincer body can be flanged or fixed to a device for storing and paying out flexible strand material. In this case, the pincer body can either be an integral part of the device for storing and paying out flexible strand material or it can be attached to such a device, where particularly the handle is configured in such a manner that it can be correspondingly adapted to this device.

The handle can be locked in the pincer body to enable the pincers to be operated without tiring in the case of large lengths of strand material that are to be wound off or up. Here it turned out to be an advantage to configure the handle in the pincer body in such a manner that it can be locked in different positions, so that each locking position is adapted for a particular thickness of the strand material. Such locking can be provided for example between the pincer body and the handle. However, it is also conceivable for the handle to be locked to the pincer body by means of a rubber ring or a metal clamp, and said rubber ring or metal clamp can be arranged on the pincer body in such a way that they can be pushed over the free end of the handle. Using a metal clamp additionally offers the possi-

bility of configuring the handle in the longitudinal direction thereof with plural notches which extend transversely to the longitudinal direction of the handle and in which the metal clamp can be locked. This, too will allow different locking positions to be set in the case of a handle which is inclined relative to the longitudinal direction of the pincer body.

Advantageously, the pincer body can have a length measuring device indicating the length of the strand material wound off or up.

According to a further feature of the invention it is provided that the pincer body has on the front end thereof a retaining member, by means of which the pincer body can be positively locked to and/or frictionally engaged with a feeder box or the like. The retaining member can be configured for example as a supporting edge, rubber cushion or claw. The advantage of this configuration especially is that in the case of high reaction forces caused by pushing the strand material into a hollow tube the pincers are lockable in the region of the feeding position, which as a rule is the region of a feeder box. Working with the pincers is made still easier thereby. But the retaining member can also have a different configuration. For example, it is possible to form the retaining member as an undercut U-shaped recess in the pincer body, and this undercut can be provided on two sides, i.e. on both legs of the U-shaped recess. Furthermore, it turned out to be an advantage to configure the retaining member as a bolt which laterally protrudes beyond the pincer body. This bolt can, for example, be formed as a shaft extension of the front guide roller.

According to a further feature of the invention it is provided for the pincer body to consist of two mutually parallel plate-shaped members connected to each other, with at least the transport device being arranged between

these plate-shaped members. Preferably, the plate-shaped members are interconnected by means of the shafts of the driving rollers and the guide rollers. Here it turned out to be an advantage to make the plate-shaped members of metal, particularly light metal such as aluminium, whereas the guide rollers are made of a viscohard plastic material and are supported on metal shafts. But it is also conceivable for the pincer body to be completely made of a plastic material.

In a further advantageous configuration of the pincers according to the invention it is provided that a guide tube for the strand material can be attached to the pincer body. This guide tube can be provided on both ends of the pincer body and serves for guiding the strand material between the pincers and a storing device for the strand material on one hand and for guiding the strand material between the pincers and the feeding position on the other hand.

The guide tube serves as a guide member. However, such a guide member can also be in the form of a helical spring. A helical spring offers the advantage that it is flexible and that the strand material passed through it is visible between the individual coils of the helical spring. In addition, said helical spring offers the advantage that due to the spacing of the individual coils said helical spring is lockable e.g. in a feeder box. Accordingly, said helical spring not only serves for guiding the strand material but also as a retaining member having the function of a hook. In addition, the helical spring is non-buckling and inexpensive. Furthermore, the helical spring is kind to the strand material, since friction between the helical spring and the strand material is substantially reduced. According to a further feature of the invention it is provided that the helical spring can,

according to its turns, be screwed into and out of a corresponding holder, so that the helical spring is adjustable in its length.

According to a further feature of the invention it is finally provided that the pincer body is configured as a tube, particularly in the region of the handle part. Consequently, the pincer body is closed in this region serving as a handhold, so that the hand operating the pincers is prevented from bruises caused by the strand material. But also burns are prevented which may be caused by strand material transported very rapidly, since any contact between the strand material and the operating hand is avoided in this region.

Further features and advantages of the pincers according to the invention will become apparent from the following description of the attached drawing. In this drawing it is shown by:

Figure 1 a lateral view of the pincers according to the invention, in an opened position;

Figure 2 the pincers according to Figure 1 in connection with a device for storing strand material, in their closed position in a lateral view;

Figure 3 an alternative embodiment of the pincers according to Figure 1 and Figure 2, and

Figure 4 another alternative embodiment of the pincers according to the Figures 1 to 3.

Pincers 1 as shown in Figure 1 are comprised of a pincer body 2 having a longitudinally extending opening for receiving a part of flexible strand material 3. The pincer body 2 consists of two plate-shaped members, of which only the plate-shaped member 4 is shown in Figure 1.

Said two plate-shaped members 4 are arranged with a distance to each other and define the opening of the strand material 3 between them. In addition, a handle 5 is supported for pivoting about an axis 6 between said plate-shaped members 4.

The handle 5 has a pressing surface 7 which has its beginning in the region of the axis 6 and which is oriented inwardly to the pincer body 2. Furthermore, the handle 5 is arranged in the region of a head part 8 of the pincer body 2 and extends in the direction of an elongated handle part 9 of the pincer body 2.

The pressing surface 7 can be pressed against the strand material 3 by moving the handle 5 towards the handle part 9 of the pincer body 2.

Opposite the pressing surface 7 of the handle 5 a driveable transport device 10 is arranged in the pincer body 2, i.e. in the head part 8 of the pincer body 2. The transport device 10 consists of two mutually spaced driving rollers 11 which are supported for rotation about shafts 12 in the pincer body 2. The transport device 10 further includes a driving belt 13 in the form of a toothed belt which is passed around the driving rollers 11 configured as driving pinions.

Both shafts 12 protrude beyond one side face of the plate-shaped member 4 and have a polygonal cross-section in this portion. To these portions of

the shafts 12 having a polygonal cross-section a driving means (not further shown) can be flanged. The driving means can be a hand crank and/or an electric motor, for example. But preferably the driving means is configured as a hand drill, of which the chuck is connectable to the polygonal portion of one shaft 12.

On its upper surface facing the strand material 3 the driving belt 13 has a coating which increases the coefficient of friction.

On both ends of the transport device 10 the pincers 1 have a guide member. In the region of the head part 8 of the pincer body 2 said guide member is configured as a guide roller 14, whereas in the region of the handle part 9 of the pincer body 2 said guide member is bar-shaped.

The guide roller 14 has a reduced cross-section in the middle portion thereof, said reduced cross-section being in the form of a groove which serves for guiding the strand material 3. As can be seen in Figure 1, the strand material 3 can be guided either on a tangent of the guide roller 14 facing the transport device 10 or on a tangent of the guide roller turned away from the transport device. The latter case is shown by means of the broken line in Figure 1.

The guide strip 15 in the handle part 9 of the pincer body 2 also has a recess which substantially corresponds with the cross-section of the strand material 3 and which extends in the longitudinal direction of the pincers 1. This recess, too serves for guiding the strand material 3.

Further it can be seen that the handle part 9 has a sheath 16 which closes at least the opening mentioned at the beginning for receiving the

strand material 3 in the pincer body 2 and which also closes particularly the bottom side of the pincer body 2. This sheath 16 serves for avoiding injuries to the hand operating the pincers when the strand material 3 is transported very rapidly.

Finally it can be seen that in the portion of the handle part 9 the pincer body 2 has a locking device in the form of a metal clamp 17, by means of which the handle 5 can be locked relative to the pincer body 2. This substantially U-shaped metal clamp 17 has on the legs thereof webs which are bent-off towards each other and which engage in diametrically opposite bores in the plate-shaped members 4 of the pincer body 2, so that the metal clamp 17 can be pivoted about these bores relative to the pincer body 2.

After the handle 5 is pressed towards the handle part 9 of the pincer body 2, the metal clamp 17 can be pushed over the handle 5, where the metal clamp 17 can take its locking in corresponding grooves 18. In this position the handle 5 is, in the region of the handle part 9, clamped to the pincer body 2 in such a manner that the required pressure of the strand material 3 against the driving belt 13 is produced, which pressure enables the strand material 3 to be transported substantially without slippage within the pincers 1.

In order that this pressure can be adapted in dependence on the length of the strand material 3 to be transported or on the diameter of the strand material 3 to be transported, the handle 5 has a number of grooves 18 which are arranged one behind the other in the longitudinal direction of the handle 5 and which extend at right angles to the longitudinal direction of the handle 5. If the metal clamp 17 is locked in the groove 18 facing the

axis 6, the pressure of the pressing surface 17 acting against the strand material 3 will be higher than the pressure produced when locking the metal clamp 17 in a groove 18 which is more remote from the axis 6.

In the front portion of the pincer body 2, i.e. below the guide roller 14, the pincer body 2 includes a retaining member 19, by means of which the pincer body 2 can be locked e.g. to a feeder box (not further shown), so that the reaction forces caused by an electric driving motor at the time of pushing the strand material 3 into a duct will not have to be compensated exclusively manually. By means of the retaining member 19 the pincer body 2 can be positively locked to and/or frictionally engaged with e.g. a feeder box. This retaining member 19 can be configured as a supporting edge, rubber cushion or claw.

In Figure 2 the pincers 1 according to Figure 1 are shown in connection with a device 20 for storing and paying out flexible strand material 3. To this end the pincer body 2 can be configured in the region of its handle part 9 in such a way that the handle part 9 is positively and/or non-positively connectable to the device 20. This will result in a system comprised of a device 20 for storing and paying out flexible strand material 3 and driven pincers 1, which pincers serve as a device or an aid for pushing-out or pulling-in flexible strand material. Here it is conceivable that the pincer body 2 is an integral part of a corresponding device 20 or is connectable and hence adaptable to such a device 20.

Figure 3 shows an alternative embodiment of the pincers 1, in which the handle 5 and the handle part 9 are configured corresponding to the outer contour of the device 20, so that any protruding sharp edges that might cause injury do not exist when the pincers 1 are mounted to the device

20. It can be seen that with the pincers 1 shown in Figure 3 the guide member provided in the handle part 9 is configured as a correspondingly bent guide strip 15. On the other hand, Figure 2 shows an embodiment of the pincers 1 in which one guide roller 14 is arranged ahead of the transport device 10 and another guide roller 14 is arranged behind the transport device 10.

Finally, in Figure 4 an embodiment of the pincers 1 comparable to that of the Figures 1 and 2 is shown, in which instead of the guide roller 14 an annular guide member 21 is inserted between the two plate-shaped members 4 of the pincer body 2.